

The Orthogonal DE for family of parabola  $y^2=4a(x+a)$  is the same as \_\_\_\_\_  
(where DE stands for Differential equation)

- a) DE of parabola  $y^2=4a(x+a)$
- b) DE of parabola  $y^2=4ax$
- c) DE of parabola  $x^2=4ay$
- d) DE of parabola  $x^2=4a(y+a)$

Soln :

$$2y \cdot \frac{dy}{dx} = 4a \Rightarrow \frac{dy}{dx} = \frac{2a}{y}$$

For orthogonal trajectory,

$$-\frac{dx}{dy} = \frac{2a}{y} \Rightarrow \int \frac{dy}{y} = \int -\frac{1}{2a} dx$$

$$\Rightarrow \ln y = -\frac{x}{2a} + k \Rightarrow y = ce^{-\frac{x}{2a}}$$